CLUSTER PHENOMENA IN NUCLEI STRUCTURE

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A cluster model is applied to the description of the low-lying alternative parity normal deformed (ND) states and superdeformed (SD) states [1,2,3]. The model is based on the assumption that cluster-type shapes are produced by a collective motion of the nuclear system in the charge (mass) asymmetry coordinate. The yrast SD band and ND band are related to ^{8}Be-cluster configuration (or two alphas on opposite sides of the heavy cluster) and to the α-particle clusterization, respectively.

All observable characteristics (parity splittings and electric dipole, quadrupole, octupole moments) of nuclei $^{220-226}$Ra, $^{220-232}$Th, $^{230-238}$U, $^{236-244}$Pu, $^{142-146}$Ba, $^{144-148}$Ce and $^{146-150}$Nd are described [1]. The results of calculations agree well with the experimental data, especially of the variation of the parity splitting with mass number of nucleus at low spin of system and of the value of the critical spin at which the parity splitting disappears.

The cluster approach provides a good description of the spectra and decay out of the lowest SD bands in nuclei ^{60}Zn, ^{190,192,194}Hg and ^{192,194,196}Pb [2,3]. As follows from our analysis of the yrast SD bands in the mass-190 region, the sudden transition from the SD minimum to the ND minimum occurs because of the crossing of SD band with the nearest neighboring excited ND band and spreading of collective states among the compound states.

A new method for the spectroscopic studies of the SD nuclei is suggested within the cluster approach.

[1] Shneidman T.M. *et al.*, Phys. Lett. B **526** 322 (2002); Phys. Rev. C **67** 014313 (2003).
[2] Adamian G.G. *et al.*, Phys. Rev. C **67** 054303 (2003).
[3] Adamian G.G. *et al.*, Phys. Rev. C (submitted).